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Journal of the Society of Arts.

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FRIDAY, SEPTEMBER 17, 1869.

Announcements by the Council.

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THE WHITWORTH SCHOLARSHIPS.

The following is a list of the successful candidates (with their ages, occupations, and the number of marks they obtained), who have been reported to the Science and Art Department as entitled to the ten Whitworth scholarships of £100 a-year each:—

Greenwood, William H., aged 23, engineer, student at the Mechanics' Institution, Manchester, 143 marks.
Hearson, Thomas A., aged 23, engineer, student, Royal School of Naval Architecture, 137 marks.
Hopkinson, John, B.Sc., aged 19, student at Cambridge University, 134 marks.
Elgood, Thos. S., aged 24, mechanical engineer, Leicester, and Owen's College, Manchester, 127 marks.
Greenhill, Geo. A., aged 21, student at Christ's Hospital School and Cambridge University, 116 marks.
Brittle, John R., aged 23, engineer, student at Sir Walter St. John's School, Battersea, 113 marks.
Philips, Thomas W., aged 23, student at British School, Millwall, and Royal College of Science, Dublin, 100 marks.
Sennett, Richard, aged 21, engineer, student at the Royal School of Naval Architecture, 98 marks.
Buckley, Robert B., aged 21, engineer, student at Merchant Taylors' School, 97 marks.
Leeds, Charles E., aged 23, B.A. (Oxon), student at Oxford University, 96 marks.

IMPROVED CABS.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis:—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.

The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

In the trials of the several carriages, the small amount of vibration and noise will be duly considered by the judges.

DESIGNS FOR CHANNEL STEAMERS.

The very defective state of the accommodation afforded by the Channel steamers, plying between this country and the Continent, having been brought under the notice of the Council, they have determined to offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria*, *Albert Edward*, and *Alexandra*, are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught:—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

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EXAMINATION PAPERS, 1869.

(Continued from page 807.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

DOMESTIC ECONOMY.

THREE HOURS ALLOWED.

1. Write a letter addressed to a young couple about to keep house, on an income of £200 per annum, mentioning the amount of weekly expenses they should incur, the number of servants and the general household arrangements, so as best to secure an economical and comfortable dwelling.

2. Describe the necessary fixtures and fittings in a sitting-room and bed-room in an ordinary tradesman's house, naming the prices at which the articles mentioned may be procured.

3. A tradesman's household consists of a man and wife, three young children, and two maid-servants. Give an estimate of what ought to be the weekly expenses in coals, meat, bread, washing and grocery, stating the cost under each of the heads separately.

4. What are the usual taxes which a person possessing and inhabiting a house rated at £50 per annum, would have to pay?

5. Mention the best methods of promoting a vigorous development of the bodily frame in boys, due attention being paid at the same time to their intellectual progress.

6. Mention some of the ordinary ailments to which young children are liable, and the best means of treating them in the absence of a medical man.

7. Write a letter of advice to a nurse, detailing the best methods of performing the duties of attendant on the sick.

8. Mention some faults commonly committed by laundry women, the causes to which they are attributable, and the effects they produce upon the appearance and quality of clothing.

9. Explain clearly the uses and properties of soda and soap.

10. How may the following articles of food be prepared, so as to be both economical and palatable: oatmeal, rice, fish.

11. Compare the advantages of linen, cotton, and woollen clothing, with regard to durability, health, and economy.

12. State what are the usual adulterations of milk, and how they may be detected.

13. State what are the usual adulterations in sugar and cayenne pepper, and how they may be detected.

14. State what are the usual adulterations in pickles, preserves, and bottled fruits, and how they may be detected.

15. Describe the best treatment for sprains, slight wounds, and whitlows.

16. Mention the precautions to be observed in rearing and fattening fowls and geese.

17. What would be the expense of lining a cistern 3 feet 6 inches long, 2 feet 8 inches wide, and 2 feet deep, with sheet lead of 6 lbs. to the square foot, estimating the lead at 18s. 8d. per cwt?

18. What would be the cost of painting six doors on both sides, the dimensions of each door being 6½ feet by 3½ feet, at 8d. per square yard?

19. How much will the turfing of a round plot cost at 4d. per square yard, if the diameter be 180 feet, and a circular fountain 18 feet in diameter be left in the middle?

20. A person twenty-seven years old saves £10 yearly, and puts it out to interest at £3 per cent., what will his savings amount to in twenty-three years?

POLITICAL ECONOMY.

THREE HOURS ALLOWED.

1. Define wealth. Explain what are the three requisites for the production of wealth, and describe with particular distinctness the assistance which is rendered to the production of wealth by capital.

2. Show that it is fallacious to consider that capital is synonymous with money. Explain the difference between fixed and circulating capital. How does it happen that labourers are sometimes temporarily injured by the introduction of machinery?

3. How does the division of labour increase the productiveness of labour? Did Adam Smith omit to enumerate any of the advantages which result from division of labour? Explain what is meant by the simple and complex co-operation of labour, and briefly describe Mr. Wakefield's theory of colonization.

4. Trace the connection between an increase of population and the value of agricultural produce. Give a brief description of Ricardo's theory of rent.

5. On what circumstances depends the accumulation of capital? Briefly describe the leading economic features of the following countries: England, India, Australia, the West Indies, and the United States. Why does not high farming pay in America?

6. Upon what depends the average rate of wages? Show that the labourers cannot be permanently benefited, but will ultimately be injured, by any agency which temporarily raises wages, by reducing the profits of capital.

7. Show that the rate of profit varies inversely with the cost of labour, and explain the three circumstances upon which the cost of labour depends. How is it that the rate of profit is extremely high in such a country as Australia?

8. Define the difference between value and price, and prove that there cannot be a general rise or fall in values. Show that it is incorrect to assert that the price or value of a commodity depends upon a ratio between demand and supply. State the three classes into which commodities must be divided, when considering the causes which determine their price or value; and show how the price or value of a commodity is determined according as it belongs to each of these three classes.

9. Describe Adam Smith's four rules or canons of taxation. State the difference between direct and indirect taxation, and describe the particular inequalities which belong to each of these systems of taxation.

CIVIL GOVERNMENT AND THE LAWS OF ENGLAND.

THREE HOURS ALLOWED.

(*From Creasy, on the Rise and Progress of the English Constitution.*)

1. What were the origin and object of the division of the country into counties, hundreds, and tithings, and what was the original constitution and subsequent alteration of the County Court?

2. What were villeins, and give a short sketch of the history of villenage?

3. What were the origin and development of trial by jury, and how far is it founded upon Magna Charta?

4. What have been the different conditions of the right of voting in counties down to the last Reform Act, inclusively?

5. What is a bill of attainder, and when and why was that mode of proceeding first introduced?

6. What were the chief points at issue between Charles the First and his Parliament, as shown by the terms of the Petition of Right? What were the form and effect and the history of that petition?

EXTRA QUESTIONS FOR THOSE WHO ASPIRE TO A FIRST-CLASS CERTIFICATE.

(*From the 3rd and 4th Books of Stephen.*)

1. What are the rights of a husband upon the property of his wife?—and in what cases has the wife a power to bind her husband by her contract?

2. What are the laws now in force for enforcing conformity with the Church of England, and upon whom are they binding?

3. What are the different sorts of corporations, and to what different jurisdictions are they subject?

4. What provision is now made by law for the repairs of highways?—and in what cases is the law productive of hardship?

GEOGRAPHY.

THREE HOURS ALLOWED.

1. Describe briefly the chief natural features of Great Britain, especially with reference to the distribution of the high grounds, and the direction of the principal rivers.

2. State, in the case of England and Wales, the principal localities of mineral wealth, and especially of the more important coal fields. What branches of manufacturing industry are identified with the latter?

3. Name, in succession, the principal seaports of the Mediterranean, Black, and Baltic Seas, stating the country to which each belongs, and any notable condition of its locality—as at the head of any gulf, mouth of any river, &c.

4. Draw a map, either of France, Italy, or Russia in Europe, showing the high grounds, river-basins, and principal towns.

5. Give a brief description of the great natural features of Germany (*i.e.*, of the whole of Germany, without reference to political divisions), or else draw a map of that country, showing the mountains, rivers, &c.

6. What portions of Germany are comprehended within the present North German Confederation? What change from the political *status* prior to the war of 1866 did its formation involve? And what gain of territory accrued to Prussia by the alterations then made?

7. State, in general terms, the extent and population of the present Dominion of Canada. What great provinces does it include, and what city forms the capital of the whole? Describe the more important natural features of the whole region.

8. Describe briefly the characteristic natural features of the Australian mainland. Say what colonies are embraced within it, and name the capital of each.

9. State the localities of the following places:—Kurachee, Zanzibar, Yokohama, Algoa Bay, Monte Video, Bahia, Callao, Mobile, Chicago, Batavia, Masulipatam, and San Francisco.

10. Say what are the characteristic productions and chief commercial resources of the following countries respectively:—Brazil, United States, European Russia, Italy, Egypt, Sweden and Norway, Belgium, and the East Indian (or Malay) Archipelago.

11. What are the chief conditions by which climate (especially as regards temperature) is regulated? Account for the fact that correspondent belts of latitude do not necessarily involve correspondent temperatures, either annual or seasonal.

12. Of the great orders of mammalia (*carnivora*, &c.) some are wanting in the native zoology of America and Australia, while others are peculiar, or nearly so, to those divisions of the earth; state the leading facts in these regards. Also give some like instances of contrast in respect of the food-plants indigenous to the Old and New Worlds respectively.

ENGLISH HISTORY.

THREE HOURS ALLOWED.

1. When was this island first visited by the Romans? Where were their chief settlements? What did they do towards its civilization?

2. In what parts of the island did the Anglo-Saxons first settle? From what part of the Continent did they come? Draw a contrast between them and the Romans.

3. At what time did the consolidation of the Saxon Heptarchy, as it is called, take place? Under what king? Mention the names of some of the more illustrious Anglo-Saxon monarchs from the consolidation of the Heptarchy to the Conquest.

4. What usages, social and political, did the Anglo-Saxons introduce?

5. In what way were the Normans allied to the Anglo-Saxons, and in what respects did they differ from them?

6. What institutions did the Romans bring with them? Contrast their character with that of the Anglo-Saxons.

7. Give a brief account of the Constitutions of Clarendon, and state the occasion to which their origin was due.

8. Under which of the Plantagenet kings did the people gain the greatest amount of political liberty, and why?

9. What is meant by the expression, "The Houses of York and Lancaster?" Give a brief account of the origin of this famous division. What permanent impression did it leave on English history?

10. Give the dates of the following:—1. Itinerant Justices. 2. Origin of the House of Commons. 3. The Provisions of Oxford. 4. The death of Mary Queen of Scots. 5. The Court of High Commission. 6. The Petition of Right. 7. The trial of the Seven Bishops. 8. The Battle of Dunbar. 9. Solemn League and Covenant.

11. Give a brief account of the state of parties in England in the year 1644.

12. Give a short account of the Bill of Rights.

13. Under whose management were our possessions increased in India? and how were they lost in America?

14. Under what reigns will you place:—1. The invention of Printing. 2. Declaration of American Independence. 3. Conquest of Ireland. 4. Union of Great Britain and Ireland. 5. Roman Catholic Relief Bill. 6. Milton's Paradise Lost. 7. Robinson Crusoe. 8. Gulliver's Travels. 9. Shakespeare's Henry IV. 10. Clarendon's History of the Rebellion. 11. Spenser's Faery Queen. 12. Magna Charta?

Special.

(*a*.) Give an account of Anne's behaviour during the troubles of her father James II.

(*b*.) By what ministers was she successively governed? Give a short account of each of them.

(*c*.) What was the cause of Dr. Sacheverell's trial? To what results did it lead?

(*d*.) Mention the names of those who were eminent as politicians, generals, or authors, during this reign; and for what actions or writings they were specially distinguished.

(*e*.) State from what authorities your information is derived.

(*To be continued.*)

DISTRICT SCHOOLS FOR PAUPER CHILDREN.

By George C. T. Bartley, Esq.

V.—THE INDUSTRIAL SCHOOLS, LIVERPOOL.

This is not, strictly speaking, a district school, as it belongs only to the parish of Liverpool, but that parish being of so extensive a nature, the schools are, to all intents and purposes, of the same description as those institutions already considered. During the year ending March, 1868, the number of scholars was 1,290. In the following statistics the cost of the new infant schools and alterations at Kirkdale have not been taken into account, as they were at the time only in progress, and could not, therefore, be considered as part of the school system.

I.—Cost of Officers and Servants.

Description of officer.	Salary.	Estimated cost of rations.	Total.	Cost per head for each child in the school.
1.—*General Staff.*	£ s. d.	£ s. d.	£ s. d.	£
Governor and Matron ...	300 0 0			
Assistant do. do. ...	100 0 0			
Chaplain	250 0 0			
Clerk and Storekeeper...	50 0 0			
Clothing Storekeeper ...	20 0 0			
Watchman	47 14 0			
Servants	298 1 11			
Clothing for ditto	132 15 10			
	1,198 11 9			
2.—*Nurses.*				
Head infirmary	30 0 0			
Under nurses	214 7 9			
	244 7 9			
3.—*Medical.*				
Surgeon	125 0 0			
4.—*Teachers.*				
Head schoolmistress	75 0 0			
Assistants	176 16 0			
Assistant masters	226 4 7			
Boys' pupil teachers ...	26 10 0			
Girls' do. do.	11 11 0			
	516 1 7			
5.—*Industrial Teachers.*				
Bandmaster	66 5 0			
Drillmaster	63 11 0			
Tailor	69 12 8			
Baker	75 8 6			
Engineer	63 8 0			
Joiner	63 12 0			
Shoemaker	71 9 0			
Gardener	60 19 0			
Industrial mistress	30 7 9			
Sewing	20 0 0			
Laundresses	62 4 11			
Cooks	25 10 0			
Blacksmith	65 13 0			
Plumber	67 10 0			
	805 10 10			
Total cost of rations to officers		*1,711 9 10		
Grand Total	2,889 11 11	1,711 9 10	4,601 1 9	3·573

II.—The Cost of Maintenance.

In the report issued to the public, this heading is divided into two, viz., provisions and necessaries; but what is embraced under each category is not given, nor is it very easy to determine. The total amount expended is £7,878 5s. 7d., which is undoubtedly very low, and gives an average cost per head of £6·107 per annum. This is less than two thirds that of the school at Hanwell. The difference may be accounted for, to a certain extent, by the average cost of the common necessaries of life being somewhat lower in Liverpool than in London, though this alone is not nearly sufficient to explain so great a discrepancy.

III.—The Cost of Clothing.

In this particular also the school bears a favourable comparison with others, the total amount spent being but £2,195 1s. 2d., or as little as £1·701 per head per annum.

IV.—Miscellaneous Expenses.

This item amounts to £3,400 9s. 6d. (including £506 4s. 6d. for the outfits of children on leaving the school for situations), or at the rate of £2·636 per head per annum. In the published accounts of the school every detail of expenditure is stated, and the manner in which the accounts are drawn up by the authorities of the Liverpool parish might form a pattern for the other schools of a similar description. The miscellaneous item is usually the one which regulates the cost of the school, as, though the other headings vary considerably, the tendency is to increase this, and to charge unnecessary luxuries under it. It may be remarked as a sign that the children here are healthy, and do not require a large amount of physic, from the fact that the sum expended in drugs, &c., amounted to but £56 10s. 1d., or not much above tenpence each child during the whole year.

V.—Farm Expenses.

This item, it is to be regretted, disappears, as the children are not employed on farm labour at all. Although it may be a question whether their labour in this branch is commercially remunerative, yet there can be no doubt but that, as a means of physical training, a farm forms a most valuable addition to an industrial school.

VI.—Rent and Repayment of Cost of Building.

This item is also very low in the Liverpool school, amounting to £1,209 16s. 1d., of which sum £1,000 was for repayment of loans. The cost per head is, therefore, £·938.

The general summary of the cost of each child per annum in this school is, therefore, as follows:—

1. Staff	£3·573
2. Maintenance	6·107
3. Clothing	1·701
4. Miscellaneous	2·636
5. Farm	—
6. Rent and redemption of buildings	·938
Total	£14·955

Although the total is not quite so low as the South-East Shropshire school, yet it is so much cheaper than most of the other large district schools, that it may be useful to compare the cost of each, reduced to a weekly standard of pounds, shilings, and pence, which is perhaps more readily appreciated than the yearly cost, given in decimal fractions of a pound.

	Hanwell.	Sutton.	Norwood.	South-east Shropshire.	Liverpool.
	s. d.	s. d.	s. d.	s. d.	s. d.
1. Staff	3 1½	1 6	1 7	1 2½	1 4¼
2. Maintenance	3 7¾	1 10¾	3 4¾	2 7¾	2 4
3. Clothing	0 8½	0 8¾	0 7¾	0 6¼	0 7¾
4. Miscellaneous	1 9¼	0 11¾	0 5¼	0 6½	1 0
5. Farm	0 4½	0 2¾	0 3	...	...
Total cost per week for each child, not considering rent ...	9 7½	5 4	6 3¾	4 11	5 4
6. Rent and redemption of buildings	2 2	1 7½	1 0	0 4½	0 4¼
Number of children in the school.	1,051	1,177	810	173	1,290

AMSTERDAM EXHIBITION.

Various arrangements have been made to assist and direct workmen who visit the Amsterdam Exhibition. There is a sub-committee specially for foreign workmen, consisting of the following:—Messrs. C. A. Cremmelin, N. G. Pierson, A. C. Waller; Alex. Daniels, Zwanenburgerstraat, P. 185, secretary. The conductors of workmen, or workmen separately, either Dutch or foreign, may apply personally or by letter to the secretaries in case advice or assistance be required.

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* As the number of servants, masters, &c., is not given in the report, which is to be regretted, it is not possible to divide this sum, as has been done in the other schools.

There is also an inquiry office in the front square of the Exhibition, for the convenience of foreign visitors, at which every kind of information is given gratis. Tickets may be had there for admission to the dormitories, and to public and private remarkable institutions. Letters should be addressed to the inquiry office of the International Exhibition.

On the appointed days (usually Tuesday, Wednesday, Thursday, and Saturday) admission tickets for the Exhibition are to be had there, on presentation of the tickets signed by the local committee.

On the premises of the Exhibition there is an exchange-office, at which foreign specie may be exchanged for Dutch money, according to the course of exchange.

In the vicinity of the inquiry-office guides will be stationed, appointed by the committee, and under the superintendence of the police. The guides are provided with a ticket showing their due appointment, and the tariff of charges, which are very low, and beyond which they are not entitled to charge. In case of dispute, application is to be made at the inquiry office.

Workmen's lodgings have also been arranged in the immediate vicinity of the Exhibition premises. A wooden dormitory has been built, consisting of two rooms connected with each other, with accommodation for 100 persons. Each room has a passage in the middle, on each side of which are small recesses with two bedplaces. Those who wish the concierge to keep their luggage for them have to pay 1d., however long or short their stay. The charge for one night in the dormitory is 1s.

Further on the Singel, near the Heilige Weg, a large room (the Militia room) has been fitted up as a dormitory. In this room 80 beds, &c., have been placed. There the charge per night is 8d. each.

A ticket of admission is required for each room in particular. These tickets may be had at all times during the day, at the inquiry-office only, at the entrance of the Exhibition grounds.

On the premises of the Exhibition a refreshment-room for the people has been fitted up. The entrance is at the side of the public road, and on that of the Exhibition. A cheque is to be had at the entrance, to be given in payment in the refreshment-room. The cheques are worth 4d. and 8d. The breakfast consists of 2 rolls and a cup of coffee, 4d.; supper the same; dinner of a portion of meat, potatoes, and vegetables, for 8d. Breakfast, dinner, or supper may be had *à la carte.* The cheque is handed in payment, and, if deficient, the money added.

The refreshment-room is open from 7 a.m., till 10 p.m. (on some evenings till 11 p.m.).

WHITWORTH METAL.

It is well known to mechanicians that Mr. Whitworth has been long engaged in testing a new process of making and casting iron or steel, which he has invented with the view of getting rid of all those accidents which arise from the air-bubbles found more or less in all iron castings, and not removeable by any amount of hammering. Mr. Whitworth has now perfected a mode of casting metal which renders it so homogeneous that it resists any given forces which can be brought to bear upon it. The following notice, from the *Times* of 31st August last, gives an interesting account of the application of the Whitworth metal to ordnance. The notice is written by an officer of the Royal Artillery, thoroughly acquainted with the subject:—

"Mr. Whitworth has long been known as a mechanician of the highest order. To him is due the accuracy with which machinery may now be made to turn out work almost perfect in its beauty and precision of dimensions. When once the transference of circular into direct or eccentric motion and the converse was achieved, it was easy to devise a thousand means of carrying the discovery into practice, and, theoretically, of producing any, even the most delicate forms. But the main difficulty had still to be surmounted. The machines themselves were imperfect in dimensions. There was no such thing as an exact plane in existence, much less an exact sphere, or cylinder, or cone. Every part of every machine was really rough and uneven in surface, however precise it might appear to the naked eye, and it is clear that wheels of imperfect roundness, turned by equally imperfect shafts, working in imperfect beds, could never turn out perfect productions. The defects continued to reproduce themselves, for the parts of new machines were made by the old ones. A beginning had to be made somewhere. Mr. Whitworth set to work to make plane surfaces of mathematical accuracy. First manufacturing three flat pieces of hard metal as exact as was possible by the ordinary means, he then rubbed two of their surfaces together till there remained no perceptible friction. He then took the third and worked it on to the two others, continuing the process till the three were so equal that, if any two of them were laid one upon the other, they touched nowhere, the upper one floating on an extremely thin film of air between them, without friction. If the edge of the upper one was pressed on the lower surface and pushed along it, followed by the body itself, there was no air between, and the two adhered together, held fast by the pressure of the atmosphere above and below. Here was the germ from which sprang exact spheres, cylinders, and wheels, the parts of machines which could be relied upon. Henceforward there was no limit to the preciseness of the productions, except the wearing of tools or of the machinery itself. But a finer test of the work was required than any then in existence, so Mr. Whitworth designed a measuring instrument, capable of marking faults for correction even if they did not exceed the one millionth of an inch. So the work produced and the parts of the machines could be rigorously tried, and many a new flight could be taken in the region of mechanics.

"When the demand came for small arms and cannon of longer range and closer shooting, Mr. Whitworth carried out a series of experiments for the government, laid down what he considered to be the laws governing the rifling of barrels and the shape of projectiles, and produced a rifle which attained results hitherto unknown. He proceeded to apply the same principles to artillery, and competed with Armstrong for the position of first artillerist in the world. But his rival had already not only designed but built a large number of guns, fulfilling in their construction the demands of practical soldiers, as well as those of scientific artillerists. The ground was already occupied, and when it was found that neither inventor could claim any very decided superiority over his antagonist, the strong practical objection to complication of guns and ammunition, by the adoption of two complete systems side by side, was, very properly, allowed to weigh against Mr. Whitworth. If the public service be the first consideration, many an ingenious inventor may find that there is no room for his works, though he may well deserve a handsome acknowledgement in one shape or another.

"Since the days of the Armstrong and Whitworth Committee, Mr. Whitworth has never dropped the subject of artillery. It was not enough for him to be acknowledged as the first machinist in England, he must also be accepted as in the front rank of artillerists —a desire which he shares in common with many others. Such an end is only to be attained by the manufacture of reliable heavy rifled guns, such as 300, 400, 500 pounders, or pieces of even higher calibre, and Mr. Whitworth was long unsuccessful in producing anything higher than a 7-inch gun. His system of gunnery is acknowledged by himself to be very severe upon the piece from which his long projectiles are fired, and we have more than once heard from his own lips that he sought in vain for a material which could be relied upon, and produced in sufficient quantities. He adopted a mild steel as the metal theoretically most adapted to withstand both strain and wear, but he found, as all makers of steel guns have found, that the greatest care was unavailing to produce trustworthy steel tubes in large quantities and of large sizes. Many a fair-seeming piece of a gun would stand steady strains perfectly, but crack when the sudden shock of fired gunpowder occurred within it. So much material could not be wasted without increasing the cost of that which was sound, nor could guns be produced rapidly or in large quantities. The English government would hardly accept 9-inch guns costing £3,200 each, except for purposes of experiment, when pieces of equal calibre could be bought from Armstrong for considerably less than half the price, or manufactured in the Royal Arsenal, on Fraser's still cheaper system, for little over a fourth. Two such guns were purchased before the late Conservative government came into office, and their shooting was, what Whitworth shooting has always been, extremely good. The experiments with them seem to hang fire, chiefly, we believe, on account of some lack of harmony between Mr. Whitworth's idea of fair experiments and those of the Ordnance Department in the War-office.

"The subject would have been of little importance, but for a most interesting and valuable attempt of Mr. Whitworth to solve the one great problem of artillerists, by producing guns at once strong, cheap, and capable of being manufactured in large quantities. In spite of all researches, the reasons for the peculiar qualities of steel are still doubtful, but the most important and undesirabe quality, that which breaks the hearts of gunners, is the uncertainty of the metal. Of two tubes manufactured at the same place, about the same time, by the same workmen, one may stand 1,000 rounds, and the other burst destructively at the first or fiftieth round, sometimes without the slightest warning.

"One reason given is, that bubbles of gas formed in the molten steel before it is set are retained by the thickening fluid, and perpetuated as flaws in the ingot, no matter how severe a hammering it may have had. Mr. Whitworth claims to have succeeded in getting rid of these gas or air bubbles entirely by the application of immense pressure to the mass of molten metal while cooling. He has four qualities of this steel, or "Whitworth metal" as he calls it. They are known as yellow (having most carbon), blue, brown, and red, the red being the most ductile. He has tried many experiments on a small scale, and considers himself to be justified in declaring that he will now be able to make heavy guns perfectly trustworthy at a price of about £120 a ton, or one-fifth higher than Sir W. Armstrong's present prices, and rather more than half his own old ones. A 9-inch gun would cost £1,800, but then its projectiles would be heavier, and its power greater than its rival of the service pattern. Mr. Whitworth is pre-eminently an advocate of small bores in guns as well as rifles, being ready to sacrifice many practical advantages for good shooting. He now asserts that he throws to the winds all fear of his guns bursting. Instead of seeking for powder of less severity, his only wish is to find means of igniting it more rapidly, and he is making preparations for the construction of 27-ton guns, or even pieces weighing over 43 tons.

"It may be that Mr. Whitworth has achieved a task which would certainly lead to the adoption of his metal for the inner tubes, at least, of all guns, whatever might be their system of shooting; but the experience of all practical artillerists denies them permission to accept experiments on a small scale, as applicable to heavy guns, in which the force of the explosion is vastly multiplied, possibly even altered in its made of action. The Government possesses two heavy Whitworth guns, but they are not made of the new metal, except in very small proportion applied to the exterior of the piece. They may be very useful to test ammunition, system of rifling, and so on, but their lasting qualities will prove nothing as to the strength of the new metal for guns, because they are made of the old metal. We understand that the superintendent of the gun factories applied to Mr. Whitworth for inner barrels, but was answered that the whole system or nothing must be taken. This seems a little obstructive; but here is a man of reputation asserting that he has the power of producing metal of extraordinary strength, and that he has actually commenced to make two 11-inch guns calculated to fire shells of 960 lbs. If he will not allow his material to be tried as part of the government ordnance, we cannot but think that it would be worth while to order one gun from him, embodying his newest ideas, and test it in every way without competition, for it seems that in this way alone can the authorities arrive at truth regarding the strength of the Whitworth metal as applied to heavy guns. It should be distinctly understood that Mr. Whitworth's system of charges and projectiles is acknowledged by him to be extremely dangerous to the endurance of the pieces of ordnance themselves, and must be rejected unless he can find material to bear the severe strain put upon it. If the new metal fails, his case falls to the ground; but it is surely worth a trial.

There is, however, another experiment possible to be carried out with the two costly guns now in the hands of the authorities. Mr. Whitworth insists that flat-headed shot or shells, very long, and therefore containing a large bursting charge, are the proper projectiles to fire at iron plates, especially when the target stands obliquely to the line of fire. We have inspected certain plates containing holes pierced or punched by flat-headed projectiles fired from the Whitworth 1¾-in. gun of 7 cwt. A plate of equal thickness with the shell was completely pierced at an angle of 45 degrees, and with a charge of 10oz. At an angle of 65 degrees the shell did not pass through, but made a ragged hole. At right angles it passed easily through a 2½-inch plate. A service gun of equal weight would have a calibre of three inches, and be capable of piercing at least the 2½-inch plate directly, probably a 3-inch plate. But it is not with these tiny pieces of ordnance that artillerists' attention is now chiefly occupied, at least out of England. The great point is to make guns and projectiles that will pierce iron-clad ships at all sorts of angles. The rough-and-ready rule with our service guns is, that a shot or shell will pass through an iron plate somewhat thicker than its own diameters; 9-inch projectile through more than a 9-inch plate, &c. But Mr. Whitworth contracts the diameters of his projectiles for the same weight both of gun and ammunition. He makes his shells long and narrow, so the rough rule has no application to them. We should very much like to see what target would be pierced by the Whitworth guns with Whitworth flat-fronted projectiles, and at what angle. The experiment is surely worth the small sum of money it would cost. It is of no use to point to experiments made with 2-inch guns. All working artillerists have been disappointed, over and over again, at the difficulty of getting big guns to do as well, in proportion to their bulk, as small ones. But there are the big guns, why not try the long, flat-fronted projectiles? When the question comes before Parliament it is sure to be made as foggy as possible. Let us try for once to state it clearly.

"Whitworth's system of artillery consists essentially in small-bore guns with long projectiles. The twist of the rifling must be rapid, because otherwise the long projectiles would turn over. All this involves a great strain upon the interior of the gun. Until now he has not succeeded in making heavy guns to stand this strain, except in small numbers, at a prohibitory price. He now asserts that he has found the material he has so long sought; but there is, as yet, no heavy gun in existence made of this material. We say, let him make one, and let it be tried. Then, there is that other question of his shells, which has nothing to do with the gun question, and may be settled by firing some projectiles out of the costly pieces now in possession of the Government. If the shells succeed, it will be interesting to know whether Mr. Whitworth can really make guns at a reasonable price capable of firing them. Then will come the last question, perhaps more difficult still to answer, where can such guns be placed without involving such a complication of ammunition and stores as would be detrimental to the public service? We hold that Mr. Whitworth has made out a case for experiment."

CHANNEL PASSAGES BETWEEN ENGLAND AND FRANCE.

Mr. John Grantham, C.E., writing to *Engineering*, says:—

"While so many magnificent schemes are being designed to improve the communications between England and France, while plans for new harbours, tunnels, bridges, and ferry-boats to carry trains are being proposed, the possibility of turning the present system to account in making an efficient means of transit seems to be lost sight of.

"The railways, both in England and France, are excellent, and, on both sides of the Channel, they are now run to the piers alongside the steamers; the only question to deal with is the transfer of the passengers and their luggage from one railway to the other with the least possible delay and discomfort.

"Now, as regards the time, let us take a similar case, and ascertain what is done with the Irish mail. A train arrives at Holyhead pier with a load of passengers and luggage, and in seven minutes, on the average, the steamer starts. On arriving at Kingstown, from the time the engines of the steamer are stopped till the stages from the shore are in their place, the time required is two minutes. We also have proofs that steamers may be constructed which shall carry the largest amount of passengers with great comfort, with very little motion and with scarcely any exposure, across from Dover to Calais in little more than an hour, and that the present harbours are sufficient to accommodate such vessels; so that it is quite possible to start a train on one side in an hour and a-half after the arrival of the train on the other, without any undue haste or discomfort. This supposes that, in addition to suitable boats, proper sheds are erected on the piers, with all modern appliances for the safe and rapid transfer of the passengers and luggage. It is, however, not intended as an argument to show that improvements in the existing harbours are not called for; on the French side these are very defective, and it is to be hoped that sufficient pressure will be put on the government, to cause them to give increased facilities at Calais or Boulogne.

"But in the meantime, and as an instalment of what must be done as regards the vessels, even should the harbours in France be improved, a proposal has been made by the writer to the South-Eastern Railway Company, and alluded to in Captain Tyler's report to the Board of Trade, to build suitable steamers for this service, and to provide other facilities which shall remove most of the grievances so justly complained of by the public.

"The railway companies have perhaps been wrongfully accused of neglecting the interests of the public, in not providing more efficient accommodation; they have, doubtless, been guided by the very prevalent impression that nothing effectual could be done until the French harbours were improved. There is, however, ample proof that such vessels as are now proposed may safely be worked, and, if employed, add considerably to the number of passengers who would cross the Channel.

"The vessel, as proposed, would be 400 ft. long, 45 ft. beam, and 600 nominal horse-power, to be built of steel, and to draw 6 ft. 6 in. water, and to steer from either end, to avoid the necessity of turning; the lower part of the ship to be cellular, so as to avoid the danger of sinking if injured by a collision, and to add to her strength. This cellular portion is 6 ft. in depth; over it would be the main saloons, these to be 10 ft. in height, and provided with ample accommodation for reclining in bad weather; good refreshment tables also would be provided, with light and air, to avoid that gloom and closeness so painful to landsmen when on board ship. Between the paddle-boxes would be a promenade deck, 100 ft. long, on the extremities of which would be the houses from which the vessel would be steered. To strengthen her amidships, with the least amount of weight, there would be provided four open longitudinal girders, about 250 ft. long, so arranged as to cause very little obstruction on the ship, and longitudinal bulkheads, about 90 ft. long, would run through the engine compartment. In addition to these precautions, the plates of the sides would be extended up, and form the inner side of the paddle-box, drawn off towards the ends at the same angle as the trussed girders.

"To facilitate the transfer of the passengers and luggage from the piers to the ship, wide and ample means are provided, at three different elevations, to receive the stages from the shore. The lowest of these is on the level of the main-deck; the next is on the level of the promenade deck, and the upper one is on the paddle-boxes or on the captain's platform; so that, whatever should be the state of the tide, the stages may rest on the top of the piers, and nearly level. On the piers should be erected sheds, under which the trains should run, as in ordinary railway-stations, to be well enclosed and lighted, so that but little delay or discomfort would arise.

"The staircases leading from the promenade platform to the deck should be easy, wide, well-lighted, and sheltered.

"The great bulk of the luggage would be stowed in trucks, the bodies of which would be hoisted by hydraulic cranes on to the deck, and again lifted off on the other side, and placed on wheels provided for them. An ordinary train might thus be transferred in about five minutes, with no exposure to the passengers or injury to the luggage.

"In all this there is no novelty introduced; all that is proposed may be seen in operation in other places. The only question that can be raised is as to the facility of working a vessel, such as is here described, in and out of the harbours. For experience in this, we refer to the American steamers, which, it is affirmed on all sides, are managed with wonderful precision. These vessels have in some instances exceeded 400 ft. in length. Those on the rivers draw 5 ft. and 6 ft. of water, and those which put to sea vary from 7 ft. to 10 ft.; but all are of immense height out of water, the wheel-houses of some being upwards of 40 ft. above the water-line. The vessel now proposed, though drawing only 6 ft. 6 in., will not exceed 15 ft. above the water-lines at the ends. Long vessels steer much more steadily in heavy weather than short ones, and will, therefore, enter such harbours as Calais or Boulogne with more safety than the present vessels, and, when fairly entered, there is time to bring them to a standstill before reaching their berths.

"In proposing this plan for crossing the Channel, it is unnecessary to allude specially to any of the plans designed by others. It may, however, be well to give the writer's reasons for not having contemplated in this vessel the system of carrying the trains across on the deck of the steamer, a plan frequently proposed and carried out in some places, but not under similar circumstances. The reasons are numerous. First, and most serious, is the necessity of placing the vessel in a position of perfect stillness before taking the trains on or off the ship. This involves new harbours on each side, with dock-gates and breakwaters to protect them. Secondly, the large ships necessary to carry the trains will take a long time in bad weather before they can be placed in position and the gates closed. Thirdly, very few persons would remain in the carriages when being put on board, and, in the event of sea-sickness, they could not be allowed to remain, so that the passengers must have time to leave the carriages and walk on board. Lastly, the large outlay in forming the harbours, appliances for shipping the trains, and the extra cost of the ships, together with the cost of working them, render it probable that the railway company would not adopt the system if prepared.

"If the plan proposed by the present writer is practicable, there is an immediate remedy for the great and most serious evils so long felt to exist in this great highway of nations, the most important thoroughfare in the world."

PARIS IMPROVEMENTS FROM 1852 TO 1868.

The improvements that have been made in Paris since 1852, remind one of the saying of the Emperor Augustus, that he found Rome built of brick and left it in marble. The following are the principal improvements which have been made in the city of Paris during the last sixteen years:—

Streets.—In 1852, the total length of the streets were 384 kils.; this length is now reduced by the reconstruction of a great part of the city, by forty-nine kils., to 335 kils. This comparison, however, gives no idea of the improvements that have been made in a sanitary point of view, neither does it show the increased facilities afforded for traffic. In 1852, the total area of the 384 kils. of streets in Paris was only 4,530,000 square metres, giving an average of twelve metres in width for each street. The area of the forty-nine kils. of streets which have been suppressed was only 325,000 square metres, or seven metres in width on the average. The streets in the zone which was taken within the limits of the city of Paris in June 1859, in spite of the numerous imperial and departmental roads and highways which crossed them in all directions, had only a total area of about 504 hectares, and averaged in width thirteen metres. On the other hand, the 95 kils. of new streets which have been opened in old Paris cover an area of 2,332,000 square metres, and average in width twenty-four metres; and whilst they have only increased about one-quarter in length, their area has been more than doubled. In the suburban zone, the forty-one kils. of new streets which have been opened cover an area of 769,000 square metres, and average in width eighteen metres. About nine kils. of new streets have also been opened by private individuals, averaging twelve metres in width; their total area is 110,000 square metres.

The total length of the network of streets in Paris now amounts to 850 kils (527 English miles) in length, and cover an area of 12,291 hectares (30,358¾ English acres). Of this, 136 kils. (84⅓ English miles), covering an area of 310 hectares (765¾ acres), have been opened during the last eleven years. The total area of Paris is now 7,802 hectares (more than 30 square miles), of which old Paris covers an area of 3,402 hectares, and the suburban zone, recently annexed, 4,400 hectares.

In 1852, there were 287 kilometres of footways, covering 730,000 square metres, in Paris proper; there now are 746,700 metres in length, and 1,601,000 square metres in area. In the suburban zone, at the time of annexation, there were 136,805 metres of foot pavements, covering an area of 341,600 square metres. Now this has been increased to 341,594 metres in length, and 1,365,550 square metres in area. This shows an increase of 459,700 metres in length, and 87 hectares in area for old Paris, and of 204,799 metres in length, and 102½ hectares in area for the suburban zone; making a total increase of 663 kilometres in length, and 189 hectares extent. The total length of the foot pavements is now 1,088 kilometres (674½ English miles), and their area is 296 hectares (731 acres).

As regards the plantations and avenues, which previous to 1852 were 38,520 metres in length, and covered 410,000 metres in old Paris, and 26,570 metres, with an area of 310,850 square metres, in the suburban zone, these now measure 83,498 metres in length, and cover an area of 806,000 square metres in old Paris, and 112,953 metres, with an area of 937,000 square metres in the suburbs; showing an increase of 44,978 metres in length, with an area of 396,000 square metres, in the former, and 86,382 metres, with an area of 626,750 square metres, in the latter, making a total of 130 kils in length, and covering an area of 102 hectares. Previous to 1852, the number of trees planted in the streets of old Paris was 32,000, and in the suburban zone 18,466, making a total of 50,466. Now there are 95,577 trees, of which 55,824 are in old Paris, and 39,753 in the suburbs.

The Bois de Boulogne and de Vincennes have not only undergone a complete transformation, but have also been enlarged; the area of the former is 847 hectares (2,092 acres), and that of the latter 800 hectares (1,976 acres). The handsome new park recently opened on the Buttes Chaumont covers 25 hectares (61¾ acres), that at Montsouris 18 hectares (44½ acres), and, lastly, the Parc Monceau, which has been for several years past a model of good order, 8½ hectares (21 acres).

Twenty-one new squares have been opened since 1852, and occupy an area of 9 hectares (22¼ acres).

Considerable improvements have been made in the Champs Elysées, and in the Avenue de l'Observatoir. The former has an area of 18½ hectares (45¾ acres), and the latter 3 hectares (7½ acres). The new Avenue de l'Imperatrice is 12 hectares (29½ acres), the Boulevard Richard Lenoir 5 hectares (12⅓ acres), and the Place du Roi de Rome 23 hectares (56¾ acres).

Bridges.—Between 1852 and 1868, the Ponts Napoleon, Solferino, de l'Alma, and the Pont du Point du Jour have been built. The Ponts de Bercy, d'Austerlitz, Louis Philippe, d'Arcole, Saint Louis et Notre Dame, the Pont aux Doubles, the Petit Pont, the Pont au Change, the Pont Saint Michel, and the Pont des Invalides. The Pont Neuf has been completely restored, and the right of toll of the Pont de Grenelle has been purchased by the town.

Lighting.—Old Paris, in 1852, was lighted by 12,579 street lamps, of which 12,494 were gas, and 85 oil lamps. This part is now lighted by 21,061 lamps, of which 20,781 are gas, and 280 oil lamps, being an increase of 8,482 lights.

The suburban zone, in 1860, was lighted by 2,484 gas and 434 oil lamps; there are now 11,539 gas and 1,252 oil lamps, being an increase of 9,880 lights.

The total number of lamps used for the illumination of the city, including the suburban zone, is 33,859, of which 32,320 are lighted by gas, and 1,539 by oil.

Water Supply.—In 1852, Paris was dependent for her water supply on the aqueduct of Arcueil which brings 1,000 cubic metres per day of 24 hours from Rungis, and the Canal de l'Ourcq, with the Aqueduct de Ceinture, which distributed 105,000 cubic metres of water from the Ourcq and its tributaries. 7,000 cubic metres of water from the Seine was raised by the hydraulic machine at Chaillot, the Gros Caillon, and at the Pont de Notre Dame. The artesian well at Grenelle furnished 600 cubic metres, making a total of 112,600 cubic metres of water per day of 24 hours for the supply of the city.

At the present time, independent of the 1,000 cubic metres supplied by the aqueduct of Arcueil, the 105,000 furnished by the Canal de l'Ourcq, and the 600 cubic metres by the well at Grenelle, 88,000 cubic metres are raised daily from the Seine, of which 60,000 cubic metres are raised by the new machinery at Chaillot and at the Pont d'Austerlitz, and 28,000 by steam pumping-engines at Maisons-Alfort, Pont l'Anglais, at Auteuil, Neuilly, and at St. Ouen, which have been purchased by the town from the Compagnie des Eaux. An artesian well has also been sunk at Passy, which furnishes 80,000 cubic metres. The water-works of St. Maur have been constructed, and raise 40,000 cubic metres of water from the Marne daily. Two other establishments at Tricbardou, and at Ile-les-Meldenses, pump up 80,000 cubic metres of water into the Canal de l'Ourcq, and the aqueduct of La Dhuis, which furnished from 24,000 to 30,000 cubic metres per day.

The total water supply now amounts to 350,000 cubic metres in 24 hours. This will further be increased by 100,000 cubic metres when the Aqueduct de la Vanne, with the reservoir at Montrouge, now in construction, is completed, and by two artesian wells which are being bored, one at the Butte aux Cailles, and the other at the Place Hébert.

The five reservoirs, which existed previous to 1852, of Monceau, Racine, Saint Victor, Panthéon, and Vaugirard, were only capable of containing 33,569 cubic metres of water, whilst the storage capacity of those which have been built at Passy, Menilmontant, Belleville, Buttes Chaumont, Charonne, Gentilly, with six other smaller ones, which have been purchased by the town from the Compagnie des Eaux, amount to 210,288 cubic metres.

In 1852, the total length of pipe was 705,360 metres, the greater part of which was of small dimensions, this has, to a great extent, been replaced by pipes of larger size. From 1852 to 1867, 674,640 metres run of new mains have been laid, varying in diameter from forty cent. to one metre, and of this 377,000 metres have been laid in the suburban zone, which before its annexation was badly provided for.

Drainage—In 1852 the length of the sewers in Paris was 107,430 metres, and, with the exception of the "Egout de Ceinture," the dimensions of the largest did not exceed 1·80 in height, and from 0·75 to 0·80 in width. Those of the suburban zone were of still smaller dimensions, and, in 1860, measured 39,300 metres in length. From 1852 to 1867, 197,370 metres of sewer of various dimensions have been constructed, the smallest being 2·30 in height, and 1·30 in width. The sizes of the others vary from 2·40 to 3·90 in height, and from 1·50 to 4·00 in width.

In the suburban zone, 165,650 metres of new sewers have been constructed, and 8,200 metres of collecting sewer outside Paris, to carry the sewage of the city to the Seine, at Asnières and Saint Denis. The greater part of the sewers of small size, both in Paris and in the suburbs, have been rebuilt, and there remain now only 15,840 metres of the old type. There are 242,670 metres of the smallest size (under 2·30 by 1·30) of the new type, and 176,160 of the largest size, provided with tramway and boat, with sluice for flushing them.

Markets.—The great general market of Paris, the Halles Centrales, covers an area of 60,000 square metres. The six pavilions forming the first group have been opened for many years, also the two principal ones in the second group, and two others quite lately. The Marché du Temple, the Marchés Saint Honoré and Saint Quentin have been rebuilt. Fourteen new local market places have been made. The new general abattoir in connection with the great cattle market at Villette has been completed within the last year, and covers fifty hectares (123½ acres). The abattoirs of La Roule, Montmartre, and Popincourt have been suppressed.

FRESH MEAT FROM THE RIVER PLATE.

An experiment of importance towards solving the question as to the possibility of obtaining supplies of fresh meat from the practically boundless plains of the River Plate has been successfully completed. It was stated in the *Times*, in April last, that the government of the Argentine Republic, and also the government of Uruguay, had granted to an English house the exclusive privilege of shipping live cattle from those States for a period of years, with entire exemption from all port charges and Customs duties, and that in the first instance a small trial would be made of the effect of the passage. It now appears that the steamer *City of Rio*, which arrived recently, brought nineteen oxen, which had been shipped at Montevideo, and had been thirty-one days at sea, with, it is said, a short supply of water and scarcely any food but the commonest hay. No casualty had occurred among them, although, from exposure and insufficient treatment, they had become extremely thin. They were hurriedly shipped, without selection, on its being found that the ship could take them, and the price paid at Montevideo was £5 per head, but a contractor at that port offers to supply any quantity at £4 per head, free on board, well prepared, and weighing not less than 800 lbs. each. It is also stated that the steamer by which these were brought had, on her outward passage, taken fifteen English bulls to Montevideo, consigned to Mr. Buschenthal, a large land-owner, which arrived after a thirty-seven days' passage (the distance being about 6,000 miles) not only all well, but, from careful treatment, in better condition than at the date of their embarkation. Of course, these experiences furnish nothing decisive as to the commercial results to be looked for from the trade, but a steamer is now building expressly for carrying it on upon a large scale. This is expected to be ready in about six weeks, and will be followed by others of a similar character.—*Mechanics' Magazine.*

Manufactures.

WOOLLEN MANUFACTURE IN ITALY.—The following statistics relating to the woollen manufactures are taken from a book recently published by Sig. Alessandro Rossi, entitled, "Dell' Arte della lana in Italia, ed all' estero guidicata all' Esposizione di Parigi, 1867." The number of persons of both sexes employed in the woollen manufacture in Italy is 25,000. The wages range from 70c. to 3f. 50c. per day. The number of spinning-frames throughout the kingdom is 673, and 6,480 looms. The following is the value of the annual consumption, production, and importation of woollen stuffs in Italy:—

	Francs.
Consumption	170,000,000
Production	74,280,000
Imports	86,635,290

Commerce.

INDIAN COTTON SUPPLY.—A member of the Society, engaged in the investigation of the endemic fever in Bengal, in writing to the Secretary, says:—"It is curious to see how a decimating fever in Bengal re-acts, more or less, upon commerce. Among the cloth manufacturing villages I find that all the cotton thread used for weaving comes from Lancashire, *i.e.*, the cotton goes from this country to Manchester to be spun into thread, and is then brought back here to be woven into native cloth. This is a singular commercial fact, but all the mechanical skill in Manchester either will not or cannot weave a dootie as a native in this country can weave it. Hence the native woven dootie will always command a market until Manchester produces a similar and cheaper or as cheap an article. Then see how a scourging fever acts on trade. In one large manufacturing village (Limuspore), nearly depopulated, the demand for English spun cotton must be at least 70 per cent. less this year than last, and if this were multiplied over a number of villages, the falling off in the demand must assume some magnitude. Probably this may have been one of the minor, unseen, and unrecognised causes at work which added its modicum in bringing about the recent deputation to his Grace the Duke of Argyll, on the subject of the depressed condition of the cotton trade. Again, in another district, I found that, owing to the fever and the causes which produced it, the produce of silk has fallen off from £30,000 a year to £5,000 a year. In some places the fever has made terrible ravages, assuming the form of a plague, and sweeping off almost the entire population."

Pearl-fishery in California.—The value of the produce of the pearl-fisheries on the coast of California, in 1868, is estimated at 40,800 dollars for pearls, and 9,600 dollars for mother-of-pearl; in all 50,400 dollars.

Consumption of Meat at Milan.—The total number of head of cattle slaughtered at Milan during 1868, amounted to 66,000.

Imports of Petroleum at Trieste.—During 1868, twenty-five cargoes of petroleum from America were landed at Trieste, amounting in all to 46,000 barrels and 15,000 cases.

Agriculture and Commerce of Greece.—The production of the land in Greece, were agriculture carried on in that country with the same degree of perfection that it is in Western Europe, would support at least five millions of inhabitants. In 1860, the production of maize, barley, and other cereals amounted to 6,130,690 kilogs. The exports of wine in 1858 amounted to 1,867,680 okes, for the value of £29,708; in 1860, to 4,238,385 okes, for the value of £44,042; and in 1864, to 5,083,127 okes, for the value of £43,035. In 1834, the number of olive trees in Greece was 2,300,000, and in 1860, 7,500,000, with a produce of 5,812,315 okes of oil. Two years later, in 1862, the export of oil was 1,209,732 okes, to the value of £53,700. In 1834, the mulberry trees were 380,000, and in 1860, they had increased to 1,500,000 in number. Until 1859, silk was one of the most important articles of export, but the epidemic disease amongst the silkworms has since considerably diminished the prosperity of this industry. In 1850, 11,805 okes of silk were exported, for the value of £18,500, whilst in 1864, only 2,919 okes were exported, for the value of £7,400. The exports of cocoons have likewise decreased from 1,493,934 okes in 1857, to 32,263 okes in 1864. The value of the exports of tobacco in 1860 was £39,300 for 831,561 okes. During the same year, 20,504 lbs. of cotton, for the value of £440, were exported; and in 1863, the exports amounted to 698,640 lbs., for the value of £27,305; and in 1864, 1,122,741 lbs. for £49,120. Since then the exports of cotton have gradually increased. In spite of the destruction of the forests in Greece, there still remains a large quantity of timber, the property of the state, and, with good administration and roads, might become a source of considerable wealth to the state. The revenue derived from the forests, in 1867, amounted to £16,820. Sheep and goats are also very numerous in Greece, and the quantity of wool exported annually amounts to 5,000 cantari, equal to about 1,107 cwt. In 1860, the number of horned cattle was 158,927. The value of the mines and quarries, in 1867, was £49,700. Greece has been celebrated from the most remote ages for her marble quarries, which are still worked in many parts of the kingdom. The French commercial code was introduced into Greece in 1835. During seven years, from 1858 to 1864, the commerce of Greece increased 40 per cent. for imports, and 10 per cent. exports. The total amount of commerce in 1864 amounted to £3,330,000, the imports being £2,210,000, and the exports £1,120,000. The most important branches of industry in Greece are the silk manufacture, tanning, soap-boiling, iron-working, and ship-building. Cotton was formerly spun and weaved by the peasants in the most primitive manner; now there are several large establishments for spinning cotton. At Siza, the tanning and dressing of leather are carried on on a large scale; in 1864 the imports of leather to Greece amounted in value to £43,490. The number of merchant vessels belonging to Greece in 1834 was 2,755.

	No.	Tonnage.
1838	3,269	84,000
1854	3,920	268,000
1864	4,528	280,342
1866	5,156	297,424

This gives 58 tons as the average tonnage of the Greek vessels. In 1864 the total number of men composing the crews was 24,949. Siza is the most important seaport and centre of the commerce and industry and of Greece. The number of arrivals and departures of Greek vessels engaged in foreign trade was 10,829, of 960,683 tons, the arrivals; and 9,352, of 1,000,215 tons, the departures. The arrivals of vessels engaged in the coasting trade was 56,354, of 2,186,553 tons, and 45,780 the departures, of 1,880,891 tons. The total tonnage of the movement of merchant shipping amounted to 6,028,342. Greece has made no insignificant figure at international exhibitions. At the Great Exhibition at London, in 1851, the number of Greek exhibitors was 36; at Paris, in 1855, the number was 131; at London, in 1862, the number was 295; and lastly, at the Paris Exhibition, in 1867, the Greek exhibitors were 305 in number. The state of the roads in Greece leaves much to be desired, and may be attributed partly to the insufficiency of the population, and partly to the mountainous nature of the country, which has put great difficulties in the way of the carrying out of such works. The number of post-offices in Greece, in 1820, was only 13; in 1850, 39; and in 1861 the number was 103. The number of letters sent in 1840 was 323,300, in 1860, 725,708, and in 1861, 1,300,000.

Exports of Silkworms' Eggs from Japan.—During the past year the quantity of silkworms' eggs exported from Japan, amounted to 2,195,651 cards. Of this number 800,000 have been sent to France, Spain, Turkey, Persia, and other countries, and the remainder to Italy.

Movement of Shipping at Venice.—During 1868, the number of arrivals from Italian ports were 521, of a total tonnage of 48,786; the number of vessels that sailed from the port of Venice for Italian ports were 687, of 52,704 tons. The number of arrivals from foreign ports were 2,578, of 308,721 tons, and the departures 2,392, of 298,581 tons; making a total of 3,099, of 357,507 tons arrived, and 3,079, of 351,285 tons sailed. In 1866, the total number of arrivals were 2,886, of 258,435 tons, and departures 2,813, of 253,883 tons. The difference in favour of 1868 is, therefore, 213, of 99,072 tons, arrivals, and 266, of 97,402 tons, departures.

Colonies.

Gold in Queensland.—It has long been believed that gold and iron were to be found in large quantities in the country traversed by the rivers that fall into the Gulf of Carpentaria. The Gilbert ranges were especially pointed out as the spot where igneous rocks, through those which are stratified, gave a reason for believing, in connection with other conditions, that deposits of gold would be found. That anticipation has been fully realised. The creeks and gullies on the Gilbert River have been proved to be auriferous, and are represented as having been found payable with a more than ordinary uniformity. A great rush in consequence took place, not only from the different districts of Queensland, but also from the neighbouring colonies, and we fear that much disappointment, and perhaps wide-spread injury, will, as usual, be occasioned to people who, without practical knowledge of gold-mining, risked everything in the hope of turning up one of the prizes in the lottery of alluvial gold-mining. There can be no doubt, however, but that in the extreme north of Queensland very valuable mineral deposits exist, but they require skill and money to develop them, none the less because the first few comers can pick nuggets out of the soil without labour or expense.

Schools in Victoria.—According to the report of 1868, it appears that there has been an increase for the year of 226 children in the school, and 5 in the reformatories. The result of the industrial training was, that at the end of the year 194 children were licensed out to employers, 115 of whom were doing well. 52 had not been reported upon.

Land Revenue of Victoria.—According to returns lately furnished by the Victorian Government Lands Department, it appears that in 1860, 29,049,338 acres of territory were occupied for pastoral purposes, for which a rental of £119,902 8s. 1d. was paid. At the present time 27,034,785 acres are occupied in like manner, at a rental of £174,331 17s. During the past year, 3,990 persons have taken up 158,354 acres of land under the 42nd clause. In the agricultural areas 303,117 acres had been applied for, and 2,261,959 acres were open for leasing on the 31st December last. The sales by auction last year consisted of 191,980 acres of land, realising £275,776 18s. 270,475 acres of commonage are available for farming and gold-fields, and the total land revenue for the past year was £870,497 4s. 9d.

IMMIGRATION TO VICTORIA.—To the inhabitants of those colonies there is something incomprehensible in the attitude of doubt and perplexity assumed by the government and people of the mother country, when confronted with the momentous question of emigration. We, at this end of the world, possessing a full knowledge of the circumstances of Great Britain and of her Australian colonies, familiar, by report, with the ever augmenting pressure of population upon the means of subsistence there; conversant by daily experience with the hindrances to material progress, which result from the want of population here, and strongly impressed by the undeniable fact that every industrious man withdrawn from the over-crowded labour market at home becomes a valuable consumer of British commodities abroad, are at a loss to understand the hesitating and temporising policy of English statesmen and the English public, in regard to a matter of vital importance to the whole empire. It cannot be denied that a redundant population, which entails an annual tax of £12,000,000 sterling upon industry and property, in the shape of poor-rates and voluntary relief, besides furnishing thousands of recruits to the vast army of the vicious and the criminal, is a frightful evil.

PRESERVATION OF MEAT.—Desultory experiments on the preservation of meat are being made by a number of the inhabitants in the Wimmera district, and to a certain extent with success. One of the most sanguine of the meat preservers states that the secret of his success is to dip the joint for a few minutes into boiling water. This he considers sufficient to prevent the action of the air, and to act as effectively as some of the most simple and less complicated agents which are now used. A suggestion has been made that the stock and flock owners of Riverina should establish packing and meat-preserving establishments in that district, which is considered one of the great fattening countries of the world. Nothing decided has, however, yet been done in the matter. An attempt has been made to float a meat-preserving company at Ballarat, but the project did not meet with the success its proposers expected, and the scheme was temporarily abandoned. Several gentlemen have, however, now taken up the matter warmly, and will commence operations without further delay.

FURTHER DISCOVERY OF COPPER IN AUSTRALIA.—Two or three weeks ago, Mr. T. Fleet, of the far north, brought to Adelaide some rich specimens of carbonates and oxides from a new discovery of copper in the north, thirty miles west of the Blueman property. They were taken from the surface of the ground, where a splendid lode of immense width is reported to be traceable for several hundred yards. Mr. Fleet placed himself in communication with several Adelaide gentlemen, and the result is that a conditional offer of £3,000 or £4,000 has been made to him for his discovery. An assay of the samples has given a return of 54 per cent. If the discovery turns out as valuable as the reports at present to hand indicate it to be, it will give a decided impulse to the formation of the railway into the north.

COTTON IN QUEENSLAND.—There is one curious feature in the present short crop, that whilst some planters have gathered from one bale to one bale and a-half per acre, others have come off with practically nothing at all. A great deal of this difference proceeds from the various descriptions of soil in which the cotton has been planted, and it is strongly suspected that the rich scrub lands and strong black soil are not so well adapted for the plant as lands of a poorer description.

STATISTICS OF SOUTH AUSTRALIA FOR THE YEAR ENDING 31ST MARCH, 1869.—There are 23,441,200 acres comprised in the colony. The extent of land in the possession of freeholders amounted to 2,270,079 acres, being an increase of 92,138 acres for the year. The area enclosed increased 929,196 acres. 533,035 acres were sown with wheat, from which 5,173,970 bushels were reaped, or an average of $9\frac{1}{4}$ bushels per acre. Barley, 21,244 acres, yield 311,142 bushels; oats, 4,210 acres, yield 59,213 bushels. Hay there was a large increase in, the acreage, say from 97,432 acres in 1867-8 to 106,644 acres in 1868-9, producing 113,167 tons. Potatoes, a decrease from 2,701 acres and 6,538 tons to 2,684 acres and 6,335 tons.

Notes.

NEW PROFESSORSHIP AT ANDERSON'S UNIVERSITY, GLASGOW.—Mr. James Young, so well known in connection with the paraffin industry, has presented ten thousand guineas to Anderson's University, for the purpose of founding a chair of technical chemistry, and establishing bursaries, scholarships, &c. Mr. W. H. Perkin, F.R.S., who, it will be remembered, delivered a course of Cantor lectures before the members of the Society of Arts during the last session, has been appointed the first professor.

CONSUMPTION OF HORSEFLESH AT BERLIN.—During the past year, the number of horses slaughtered for food at Berlin was 4,044.

NEWSPAPERS IN ITALY.—In 1868, the total number of newspapers published in Italy was 842, in 115 towns. Six were published in Frenda, viz., 2 at Aosta, and 4 at Florence; 1 in English at Naples, 2 in the Neapolitan dialect, 2 in Piedmontese, 2 in the Venetian dialect, and 1 in Genoese. The greatest number of newspapers are published at Florence, viz., 126; then Milan, with 104; Turin, 82; Naples, 76; Genoa, 47; Venice, 29; Bologna, 29; and Palmero, 27.

THE IMPROVEMENTS OF PARIS AND THE CITY DEBT.—The Corps Legislatif was, during the late session, occupied with the discussion of a bill, the object of which was the approval of a treaty made between the city and the Credit Foncier for the reimbursement of a sum of four hundred millions of francs due by the city of Paris, for the execution of works of public utility. It is not our province to enter into the political phase of the question, or to discuss the charges of irregularity brought against the authorities of the Seine, but the cost of the great works carried on there since 1862, is a matter of general interest. The following statement is translated in full, and without correction of evident errors, from the *compte rendue* of the speech of M. Genteur, the government commissioner charged with the conduct of the debate:—"The total expenditure of the city of Paris, for road and other works, independently of a subvention of ninety-six millions of francs received from the government, has been 1,876,170,080 francs. Since 1852, there has been paid a total of 1,399,991,195 francs, 850 millions of which were derived from the excess of municipal receipts over expenditure. There remain to be paid 465 millions, which sum is the object of the treaty with the Credit Foncier. In addition to the above-named sum, the city owes 490 millions on account of previous loans; the sum due then for the various series of new roads, streets, &c., and for loans, 953 millions; and in addition, 156 millions due by the Caisse des Travaux Publics; total, 1,100 million francs (£44,000,000)." In the speeches of this gentleman, and those of the ministers, we find the following additional information. The cost of the first series of new boulevards and streets, namely, the Rue de Rivoli and the Boulevard Sebastopol, was 270 millions, that of the second series 410 millions, and of the third 300 millions, in all 980 millions of francs, or £39,200,000; and this account does not include the alterations still in hand. The sum of 707 millions has been expended on buildings and improvements of various kinds; thus 61 millions have been spent on religious structures; 55 millions on hospitals and asylums; 129 millions on schools, lycées, mairies, and municipal edifices of all kinds; 38 millions on markets; and, lastly, 195 millions on promenades, squares, and lighting apparatus. As regards current expenses, the octroi service cost 3,000,000 francs a year in 1847; it had increased to 8,300,000 francs in 1867, but the per-centage has diminished, the rate being, in 1847, 10 per cent. It must be remembered, however, that the boundaries of the city, where the octroi duties are levied, have been enormously extended. The expenditure for primary instruction was increased from 1,100,000 francs in 1847, to 5,450,000 francs in 1867. The maintenance of the pavements, sewers, and the lighting of the promenades, &c., had risen during the same period from 4,300,000 frs. to 23,600,000 frs. The cost of keeping up the parks and public gardens has also increased from 250,000 frs. to 2,600,000 frs. per annum.

GLUE WHICH WILL UNITE POLISHED STEEL.—The following is a Turkish receipt for a cement used to fasten diamonds and other precious stones to metallic surfaces, and which is said to be capable of strongly uniting surfaces of polished steel, even when exposed to moisture. It is as follows:—Dissolve five or six bits of gum mastic, each the size of a large pea, in as much spirits of wine as will suffice to render it liquid. In another vessel dissolve in brandy as much isinglass, previously softened in water, as will make a two-ounce phial of strong glue, adding two small bits of gum ammoniac, which must be rubbed until dissolved. Then mix the whole with heat. Keep in a phial closely stopped. When it is to be used, set the phial in boiling water.—*The Stationer.*

WATERPROOF PACKING PAPER is thus made by some manufacturers:—The paper must first be covered with a resinous liquid, then painted over with a solution of glue and soot, as, without this, the paper will later show blotches. After this is dried, the actual waterproof coat is applied. This is prepared with 2½ ozs. of powdered shellac, dissolved in two pints of water, which is gradually brought to boil, and stirred until the substance is perfectly dissolved and softened, when gradually ⅓ oz. of powdered borax is added, until an intimate union of the substances takes place. The liquid is then left to cool, and, while still hot, any mineral colour may be added, such as lampblack, yellow ochre, red ochre, iron blue, or burnt umber, whereupon it is left to get entirely cold. It is then ready for use. The operation can be so quickly performed with a brush that two women can prepare 3,000 feet in ten hours.—*The Stationer.*

Patents.

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From Commissioners of Patents' Journal, September 10.

GRANTS OF PROVISIONAL PROTECTION.

Ale, &c., fining and clarifying—2519—J. Valters.
Billiard tables, &c.—2564—R. J. Westley.
Boxes, fancy circular—2338—G. C. Ramsey.
Buoys, &c.—2357—E. W. Hawes.
Carding machines—2533—C. D. Abel.
Carriage breaks—2575—A. McNeile.
Carriage wheels, &c.—2578—T. Coles.
Carriages, &c., sunshades for—2551—J. Ritchie.
Cast-iron, producing wrought-iron and steel from—2538—E. A. Cowper.
Cast-iron, &c., treating conglomerates of—2553—T. S. Blair and F. Ellershausen.
Chaff-cutting machines—2522—R. Maynard.
Charcoal filters—2463—J. Prato and F. Polacco.
Coffee, &c., hulling, &c.—2544—B. Hunt.
Combustible compounds—1911—W. R. Lake.
Cops for wefting and warping purposes—2523—C. Mackay and T. K. Wheeler, jun.
Cotton, &c., machinery for spinning and doubling—2517—T. Briggs.
Elastic seats—2574—A. P. Tronchon.
Fire-arms, &c., breech-loading—2513—J. Williams.
Furnaces—2570—H. E. Newton.
Furniture, &c., casters for—2423—I. E. Woolf.
Gas—2313—P. R. Hodge.
Gas, purifying, &c.—2395—S. J. Woodhouse.
Gloves, fastenings for—2562—R. Priestley.
Grain, &c., apparatus for loading or discharging—2556—J. Holdsworth.
Hops, appliances employed in the cultivation of—2527—T. Coley.
Iron and steel, &c.—2540—J. M. Stanley.
Jewellery boxes, &c.—2567—W. F. Williams.
Kilns for burning limestone, &c.—1456—H. Robinson.
Lace—2536—H. Yates.
Lard, &c., refining—2547—W. R. Lake.
Looms—2549—S. C. Lister.
Looms—2576—W. Glover.
Mangling and squeezing machines—2554—J. Butterworth and J. Ainsworth.
Mattresses, &c., springs for—2545—J. Teychenné.
Mine shafts, &c., safety cages for—2571—C. R. Stooke.
Motive-power, obtaining and applying—2529—H. Call.
Nails, &c., machinery for manufacturing—2569—W. E. Newton.
Paper pulp and paper—2552—C. Duff.
Paper pulp, treating wood for the production of—2566—T. Cattell.
Printing machines—2601—A. Ogg.
Railway chairs, &c.—2599—H. Bridgewater.
Railway signal posts, &c.—2595—E. D. Temple.
Railway sleepers—2543—W. E. Gedge.
Railway trains, communication in—2557—R. H. Herriott and C. and W. A. Plumbe.
Railway water cranes—2550—R. C. Rapier.
Reaping machines—2579—T. Wardlaw.
Rests for supporting the arms, &c.—2591—R. Pitcairn.
Rotary engines and pumps—2561—J. Loader.
Sash frames, &c.—2593—P. McGough.
Sewing machines—2433—T. Coad.
Sewing machines—2483—W. Jones.
Sewing machines—2524—T. Shakespear and G. Illston.
Sewing machines, metallic belts for driving—2568—W. Winter.
Ships' cabins—2532—W. Brown.
Steam boilers, &c., safety apparatus for—2559—C. S. W. Muir.
Steam condensers, &c.—2535—B. Hunt.
Stoves—2560—R. C. Robinson.
Stoves, &c.—2542—F. J. Drechsler.
Telegraphs and relays, needle and alphabetical—2603—G. Henley.
Tell-tale clocks—2511—J. Frengley.
Vehicles, measuring and indicating the distance travelled by—2541—O. Vivier.
Velocipedes, &c.—2558—J. Brown.
Washing machines—2577—W. E. Newton.
Watches, &c.—2563—L. Goldberg.
Wire-work—2572—F. W. Potter.
Woollen fabrics, &c., apparatus for pressing—2585—G. H. Nussey and W. B. Leachman.
Yeast, manufacturing—2530—G. Zoeh and A. Lehmann.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Motors, constructing electro-magnetic machines as—2597—T. Slater.

PATENTS SEALED.

741. J. B. Bernier.
754. H. Ormson.
766. G. Bray.
784. J. Tenwick.
795. W. R. Lake.
805. W. and C. S. Catt.
1231. W. Robinson.
1846. J. Tangye.
2166. J. H. Johnson.

From Commissioners of Patents' Journal, September 14.

PATENTS SEALED.

798. W. McAdam and S. Schuman.
802. W. Robertson.
806. E. Roper and G. Shaw.
812. H. Claughton.
814. M. Rourke.
818. J. H. Bennett.
822. G. R. Mather.
834. J. Cox.
836. J. Thomas, W. Bacon, and H. Groves.
837. F. W. Fox.
838. A. Albini.
850. H. Whitehouse and W. Probert.
855. J. Kay.
864. W. G. Crossley.
965. T. A. Dillon.
1001. J. Cruttenden & T. Wells.
1018. F. W. H. Medhurst.
1032. J. Sterriker.
1034. G. T. Bousfield.
1061. W. E. Newton.
1088. A. V. Newton.
1102. D. B. Peebles.
1135. A. V. Newton.
1268. J. Crabtree.
1316. J. Frölich.
1343. J. Wilson.
1385. C. J. Galloway and J. H. Beckwith.
1600. J. Brittain.
1734. F. Lewis.
1746. A. C. Engert.
2043. F. Walton.
2114. S. E. Crispe and J. West.
2148. R. P. Williams.
2173. W. Leftwich.
2234. J. Hayward.
2248. W. Dredge and A. Stein.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2374. B. Bayliss.
2375. C. C. Connor.
2388. G. T. Bousfield.
2430. A. V. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2509. T. Molineux.
2514. J. R. Johnson and J. S. Atkinson.
2481. W. Hirst.
2506. W. Richards.
2520. G. Bedson.